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ME469: Common Discretization Approaches: Comparing CVFEM and FEM

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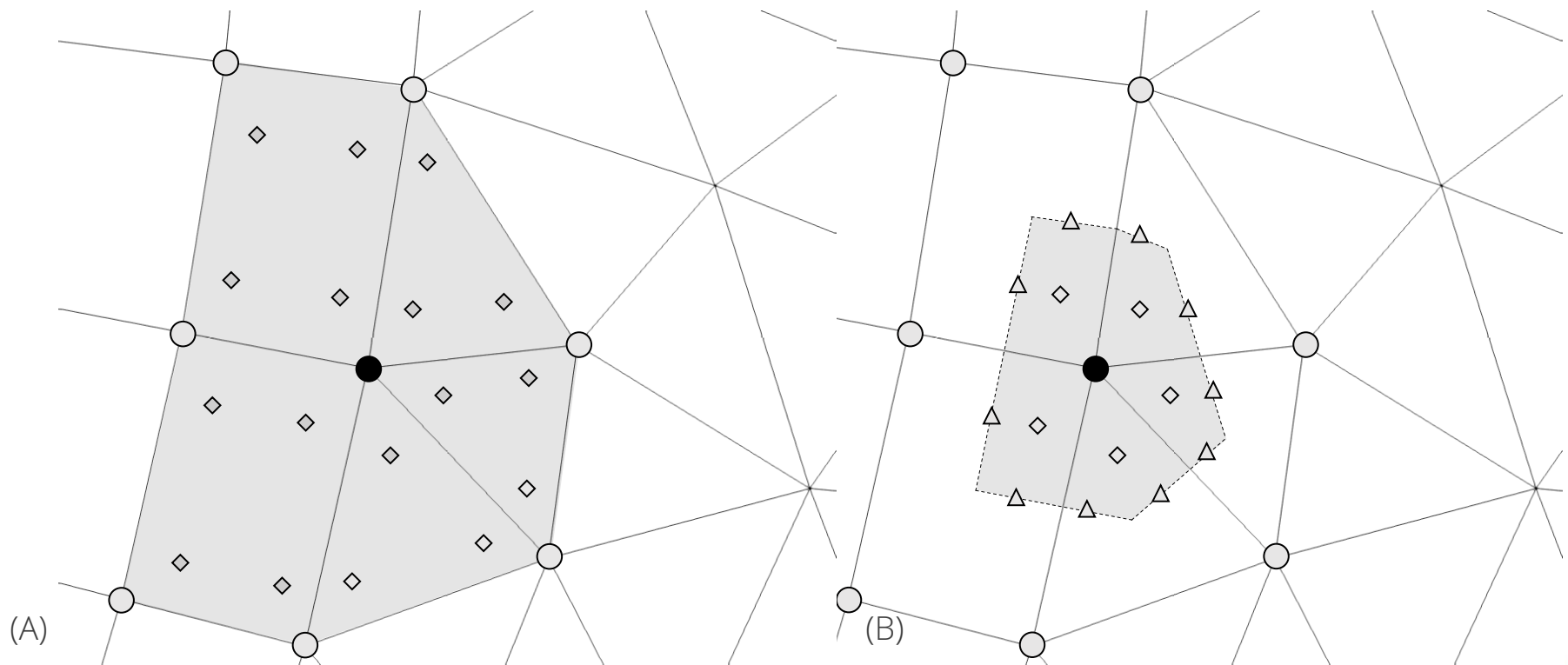
SAND2018-4536 PE





Element-Based Stencil Comparison

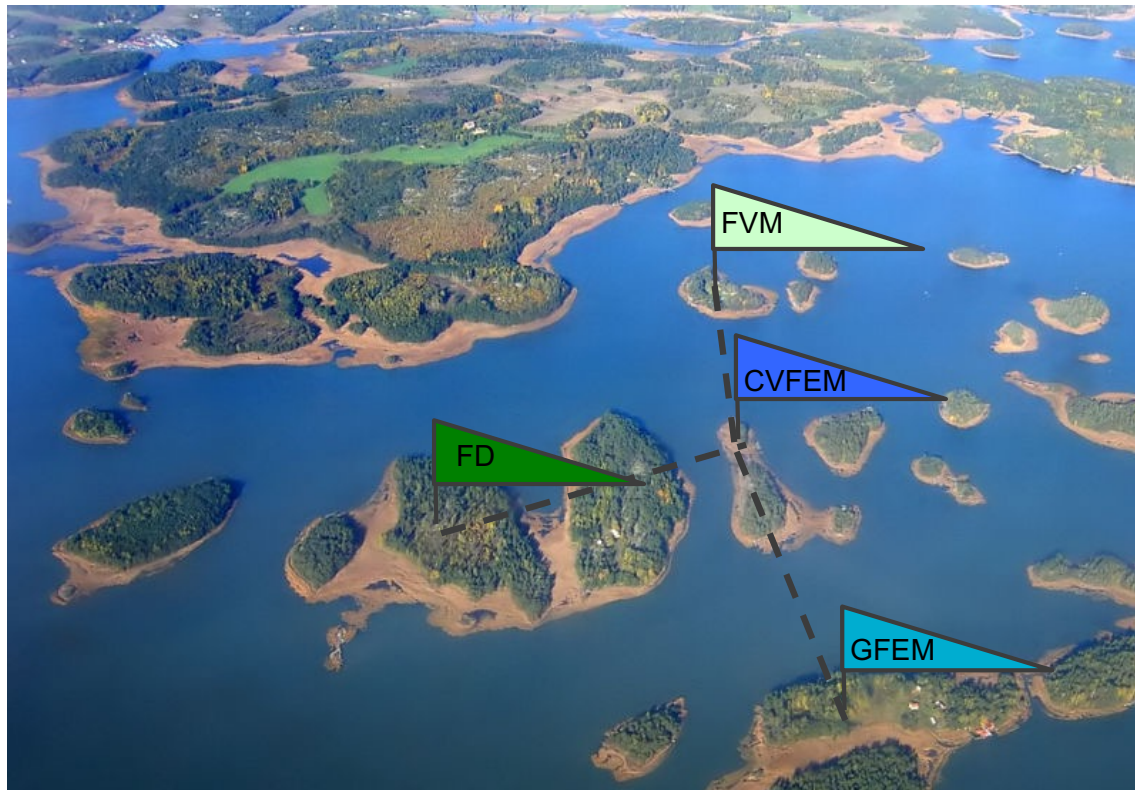
- FEM (A) and CVFEM (B)





Philosophy: Bridges, not Walls

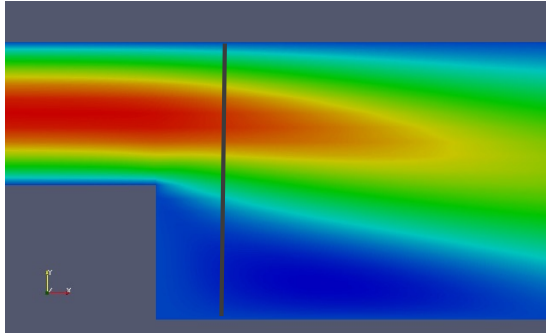
- ME469 Tenant: Let's work to understand how each method relate to one another



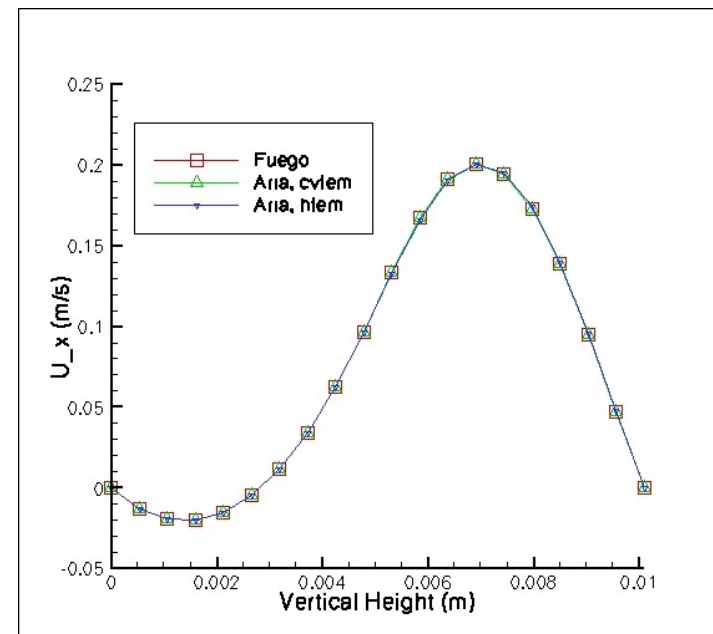


Laminar Backstep

- Laminar back step ($Re = 389$ based on step height) comparing two code implementations for CVFEM (Sierra/Fuego and Sierra Aria), FEM (within Aria – here termed, “hybrid” FEM, or HFEM – essentially, the same low-Mach CVFEM approach with full integration-by-parts).

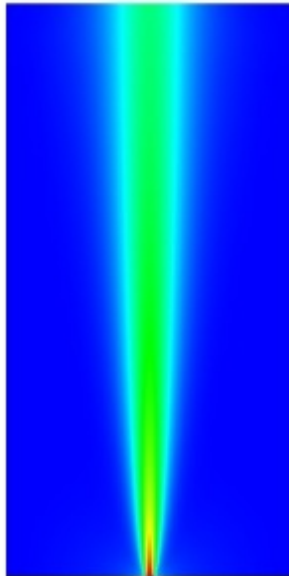


X-component of velocity
Vertical line represents one-D
line plot location

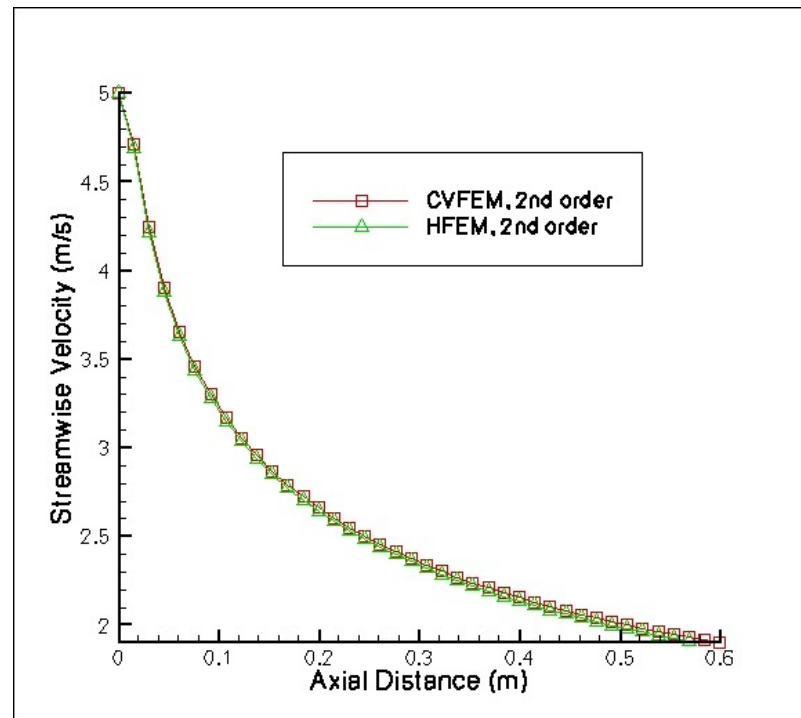




Laminar Jet



Y-component of velocity





Order of Accuracy

- Comparison of a linear underlying basis (nominally, second-order in space)
- Challenging two-dimensional variable density low-Mach flow using method of manufactured solutions; DOFS: u , v , p and Z ; density = $f(Z)$

